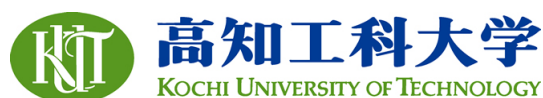


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CHALLENGES FOR MORE EFFICIENT AND EFFECTIVE ASSET MANAGEMENT AND GOVERNANCE FOR INFRASTRUCTURE: MAINTENANCE EXPERT TRAINING PROGRAM IN GIFU

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ABSTRACT: Gifu University and Gifu Prefecture have established a training system called “Maintenance Expert Training Program” for talented engineers for a regional regeneration in 2008. The system has been sponsored by the Special Coordination Funds for Promoting Science and Technology from Ministry of Education, Culture, Sports, Science and Technology (MEXT). The engineer who finished the course and passed the final certifying examination can acquire the title of “Maintenance Expert (ME)”. The role of ME is to contribute to the regional activation with preparation of new infrastructure, planning/design/operation of the maintenance for existing structures. This paper describes the overview of the training program as well as the other activities of CIAM (Center for Infrastructure Asset Management technology and research) established in Gifu University to carrying out this program, which we believe is an innovative framework for training talented engineers for the infrastructure asset management.

KEYWORDS: asset management, maintenance expert, training program

1. INTRODUCTION

Not only repairs of infrastructures from their damages by natural disasters but also the impoverishing of the regional construction companies which undertake maintenance works for existing overage infrastructures become serious social problem. To overcome these serious problems, it is necessary for both of administrative organization and construction industries to build up the social framework of the technical improvement as a key action.

Gifu University and Gifu Prefecture have established a training system called “Maintenance Expert (ME) Training Program” for talented engineers for a regional regeneration in 2008. This paper describes the overview of the training program as well as the other activities of CIAM (Center for

Infrastructure Asset Management technology and research) established in Gifu University to carrying out this program, which we believe is an innovative framework for training talented engineers for the infrastructure asset management.

2. MAINTENANCE EXPERT PROGRAM

2.1 Overview

The Maintenance Expert Program is managed by the Special Coordination Funds for Promoting Science and Technology from Ministry of Education, Culture, Sports, Science and Technology (MEXT). This is a 5 year project from 2008 to 2013. Each regional engineer can be qualified by finishing all the required courses with the common and the advanced knowledge of infrastructure maintenance in short-term intensive curriculum. The engineer who

finished the course can be given the title of "Maintenance Expert (ME)". The role of ME is that ME's contribute their share to the regional activation with preparation of new infrastructure, planning /design /operation of the maintenance for existing structures. The target numbers of qualified engineers as ME are 50 engineers in first 3 years and 100 engineers in 5 years.

2.2 Objectives and Missions

This program aims at cultivating human resources for the prefectural construction industries to ensure high levels of safety and security and regional activation. The missions of ME in particular are to contribute to regional regeneration and progression through the following activities;

For prefectural staff:

settling a long-/medium-/short-term maintenance and management plan of infrastructure at prefectural office or at Construction Research Center of Gifu Prefecture.

for engineers in regional industries:

playing a main role in disaster prevention or infrastructure maintenance works at his/her origin company, JV, or consortium, and endeavoring to guarantee the quality of the work of regional construction companies and to deliver a technical proposal of good quality.

2.3 Eligibility

Prefectural staffs who have engaged with maintenance of infrastructure for over 2 years and engineers in the regional industries who have engaged with works concerning about investigation, design, construct, and/or maintenance of infrastructure for over 3 years are eligible for this program.

2.4 Schedule and Curriculum

Overall schedule for ME training program is

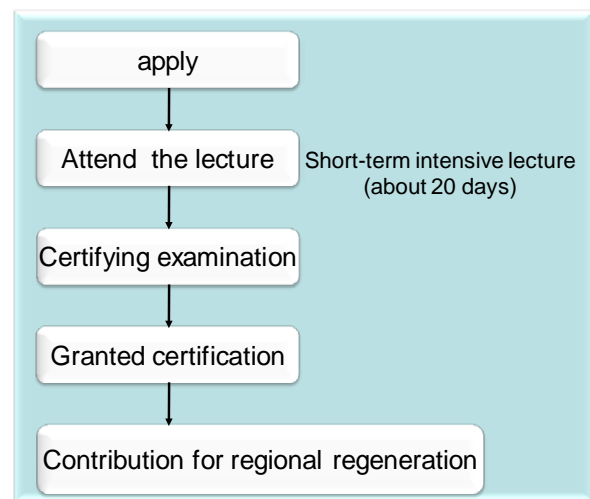


Figure 1. Schedule of ME Training Program.

Table 1. Curriculum.

<u>Basic courses of Asset Management (classroom lecture)</u>	<ul style="list-style-type: none"> - Introduction of Asset Management - Theory of Risk Management - Verification of Risk Assessment - Financial Theory - Seminar of Asset-Management
<u>Design of infrastructure (design practice in classroom);</u>	<ul style="list-style-type: none"> - Introduction to Infrastructure Design - Design Practice - Infrastructure Inspection, Maintenance, and Reinforcement Design Practice - Quality Management Practice
<u>Practical Course in Inspection, Maintenance and Reinforcement(re al-field work);</u>	<ul style="list-style-type: none"> - Maintenance and Repair Theory - Inspection and Management Practice - Inspection, Maintenance and Reinforcement Method Practice - Construction Management Theory

summarized in Figure 1. To minimize the influences on their daily works, the lectures are provided for consecutive twenty days. The short-term intensive curriculum consists of three main lecture types. The curriculum is summarized in Table 1.

2.5 Current Achievement

The ME program has planned to open every half-year, beginning at the latter half of financial year 2008. Up to now, three courses have been provided and produce 45 MEs (20 from prefectural government and 25 from local construction companies). The fourth courses will start from May,

2010.

2.6 Agreement of Regional Training Program with Nagasaki University and CAESAR

To continually improve the quality of the ME training program, in 2008 the ME Unit has made an agreement with “Michimori Training Program Unit” of Nagasaki University and Center for Advanced Engineering Structural Assessment and Research (CAESAR) at Public Works Research Institute where similar training program has been established. Michimori Training Program Unit runs a similar training courses and the mission of CAESAR is to develop, maintain, and renew human resource programs that will ensure the continuing development and excellence of the national highway bridge maintenance system.

3. Gifu University Center for Infrastructure Asset Management Technology and Research

3.1 Objectives

To operate and manage the ME training unit, Gifu University established CIAM (Center for Infrastructure Asset Management Technology and Research) in 2008. CIAM also aims at developing leading-edge technology that contributes to establish the safer and more secure society. CIAM can contribute greatly to the regeneration of construction-related businesses, and leads to reactivate the related industries.

3.2 Organizations

CIAM consists of three research laboratories, Infrastructure Investigation Technology Research

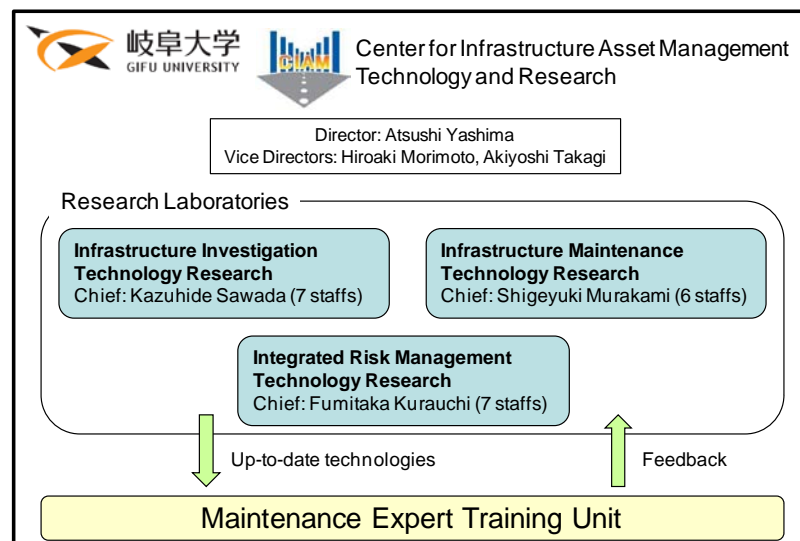


Figure 2. Structure of CIAM

Laboratory, Infrastructure Maintenance Technology Research Laboratory, and Integrated Risk Management Technology Research Laboratory. Infrastructure Investigation Technology Research Laboratory seeks more cost-efficient and simplified method of inspecting the condition of the infrastructures. Maintenance Technology Research Laboratory attempts to develop new maintenance technologies, to evaluate the developed technologies, to assemble the developed technologies into existing structures. Integrated Risk Management Technology Research Laboratory attempts to establish the methodology of evaluating the integrated risk of infrastructure and propose an efficient asset management strategy to minimize a lifecycle cost. The curriculum of the ME training unit is continually updated by reflecting the up-to-date research outcome from the three laboratories. Figure 2 describes a structure of CIAM.

3.3 Staffs

CIAM is an interdisciplinary center. CIAM consists of 15 researchers from Faculty of Engineering, 3 from Information and Multimedia Center, 3 from River Basin Research Center, 1 from Faculty of Regional Studies and the other from Faculty of

Table 2. List of Staffs

	<i>Title/name</i>	<i>Major</i>	<i>Organization</i>
Director	Prof. Atsushi Yashima	Ground Disaster Prevention Engineering	Engineering
Vice Director	Prof. Hiroaki Morimoto	Concrete Engineering	Engineering
	Prof. Akiyoshi Takagi	Project Evaluation	Engineering
Infrastructure	Prof. Yuichi Uchida	Concrete Engineering	
Investigation	Prof. Fusheng Li	Water and Wastewater Engineering	IMC
Technology	Prof. Seiro Shinoda	River Basin Environment Engineering	RBRC
Research Laboratory	Assoc. Prof. Koji Kamiya	Geotechnics	Engineering
	Assoc. Prof. Kazuhide Sawada	Geotechnics	RBRC
	Assoc. Prof. Guichen Ma	Geotechnical Structure Prevention Engineering	Engineering
	Assist. Prof. Masaya Hinokio	Geotechnical Structure Prevention Engineering	Engineering
Infrastructure	Prof. Takeshi Sato	Environmental Geotechnics	Engineering
Maintenance	Prof. Keitetsu Rokugo	Concrete Engineering	Engineering
Technology	Prof. Kazuhiro Takamizawa	Environmental Microbiology	Applied
Research Laboratory			Biological Sci.
	Assoc. Prof. Koichi Kobayashi	Concrete Engineering	Engineering
	Assoc. Prof. Shigeyuki Murakami	Bridge Engineering	IMC
	Assist. Prof. Shinichiro Tsuji	Ground Disaster Prevention Engineering	Engineering
Integrated Risk	Prof. Yusuke Honjo	Geotechnical Design Engineering	Engineering
Management	Prof. Masata Sugito	Earthquake Engineering	RBRC
Technology	Prof. Nobuoto Nojima	Earthquake Engineering	Engineering
Research Laboratory	Assoc. Prof. Sakae Mitsui	Regional Economics	Regional Sci.
	Assoc. Prof. Fumitaka Kurauchi	Transport Planning	Engineering
	Assoc. Prof. Takashi Hara	Ground Disaster Prevention Engineering	Engineering
	Assoc. Prof. Yoshifumi Demura	Landscape Design	Engineering

IMC: Information and Multimedia Center, RBRC: River Basin Research Center

Applied Biological Sciences. Table 2 shows a list of staffs in CIAM.

3.4 Technologies in CIAM

Currently, CIAM has following technologies, which can be delivered to open public.

1) Infrastructure investigation technology

- Prediction of seismic motions,
- Evaluation of seismic resistance of infrastructure,
- Investigation and evaluation of damage level of infrastructure,
- Investigation and evaluation of infrastructure soundness.

2) Infrastructure maintenance technology

- Evaluation of load capacity,
- Evaluation of durability,

- Evaluation of restoration and improvement technology.

3) Integrated risk management technology

- Strategic planning for bridge prolongation,
- Hazard map for scenario earthquake,
- Risk evaluation technology,
- Multipurpose decision-making technology,
- Prioritizing in maintenance of infrastructure.

4. Activities of CIAM

The activities of CIAM are summarized at Table 3.

Since one the missions of CIAM is to establish the safer and more secure society, the importance of infrastructure should be well understood by citizens. For this purpose, we have been hosting many symposia. Number of attendants at some symposia is

Table 3. Activities.

<i>Date</i>	<i>Summary</i>
2008.7.1	Establishment of CIAM
7.17-18	Hosting Gifu University Open Lecture: "Leading edge in Engineering -2008- 'Regional Disaster Prevention and Asset Management of Geotechnical Structure'" (76 attendants)
7.31	Hosting Symposium on "'The attainment of Safer and securer Land Prevention' and 'Regional Innovation' by means of Engineers training program sponsored from Special Coordination Funds for Promoting Science and Technology from Ministry of Education, Culture, Sports, Science and Technology"(102 attendants)
10.29-30	Exhibition at Construction Technology Fair in Chubu, 2008.
11.3-4	Exhibition at Gifu University Techno-fair.
11.17	Opening of 1st course of ME Training Program
11.28	Hosting 15th Gifu Symposium "Challenges for Safer Society and Regional Renovation: Maintenance Technology of Roads". (more than 400 attendants)
2009.2.6	Presentation about ME Training Unit at Gifu Infrastructure Research Center
3.13	Conferment of ME qualification for the 1st course (14 qualified MEs)
5.18	Opening of 2nd course of ME Training Program
6.20-21	Exhibition at the 8th Industry-academia-government collaboration promotion congress.
8.7	Conferment of ME qualification for the 2nd course (17 qualified MEs)
8.24	Opening of 3rd course of ME Training Program
9.25	Hosting Symposium on "Challenges for Safer Society and Regional Renovation: Maintenance Technologies for Steel Bridge" (more than 300 attendants)
11.6	Conferment of ME qualification for the 3rd course (14 qualified MEs)

more than 300, and the center has been well recognized within the region.

5. Collaboration with Gifu Prefecture

Regional government and also regional constructor should attempt the followings,

- put ME, who have been trained in this program, to practical use in maintenance works of infrastructures,
- endeavor to realize safer and securer community,
- assemble business model from each maintenance work,
- manage the above business model to activate the both community and regional constructor.

5.1 THE ME from Government

A solution for practical use of ME, who is a municipal staff, is related to the preventive maintenance system for road structures, so called the asset management system. The asset management system consists of the following schemes, such as design and construction, health inspection and

evaluation, prediction of deterioration and maintenance planning. In each practical use of ME in these schemes seems to be effective.

In the "design" scheme, initial conditions of infrastructures are defined and they have much influence/effect on maintenance works in the future. The ME may attend a meeting as an administrator or as a member of value engineering design team and manage the design paying attention to the long-life design and cost-saving of maintenance works. In the "inspection" scheme, engineers must control the latest condition of structure and up-to-date knowledge about maintenance works are required in order to carry out proper inspection. In the "management and planning" scheme, a certain engineering ability enables to level the budget, to acquire the budget, to enhance their accountability.

At present, the ME has engaged with the following missions in order to improve their abilities,

- drawing up the inspection manuals of road structures,
- planning and opening the training course intended for government staff in both prefecture and

municipalities.

5.2 Maintenance Supporter

Gifu prefectural government starts to authorize a maintenance supporter, so called MS. The MS are recruited from local citizens and they are volunteers. Their missions are as follows,

- inspection of the infrastructure
- report to the administrator if something is wrong,

Gifu prefecture attempts to prepare a business model through the cooperation of the ME with MS on maintenance work in regional area. The MS reports the warnings and cautions of road structure to the ME. The ME inspects road structures by themselves, gather the information from the MS, and consult the measures against the warning and the caution.

6. SUMMARY

This paper describes the overview of the training program as well as the other activities of CIAM (Center for Infrastructure Asset Management technology and research) established in Gifu University for carrying out this program. The training program is very unique, and might be an important breakthrough for maintaining social infrastructures not only by municipal government but with citizens. As for further study, we should appraise our activities, whether it really contributes the improvement of our quality of life, and/or reactivates the region.